CLAIMS

What is claimed is:

1. A lens device comprising:

a first partition that is flexible and optically transparent;

a second partition that is coupled to the first partition, wherein at least a portion of the second partition is optically transparent, and wherein a first cavity is formed in between the first partition and the second partition;

a first fluidic medium positioned within the cavity, the fluidic medium also being optically transparent; and

a first component capable of controlling a parameter of the fluidic medium,

wherein when the parameter of the fluidic medium changes, the first partition flexes and an optical property of the lens is varied.

2. The lens device of claim 1, wherein the first partition is a flexible membrane formed from at least one of a thin plastic polymer and a flexible, optically transparent material.

3. The lens device of claim 2, wherein the first partition is formed from polydimethylsiloxane.

4. The lens device of claim 1, wherein the second partition is a rigid partition formed from at least one of a plastic and a material that is at least partly optically transparent.

5. The lens device of claim 4, wherein the second partition includes at least one channel allowing for the first fluidic medium to at least one of enter and exit the cavity.

6. The lens device of claim 4, wherein the second partition includes a first portion that extends substantially parallel to the first partition when the first partition is in

an unflexed position and also includes a second portion that extends substantially perpendicularly to the first portion.

7. The lens device of claim 6, wherein the cavity is substantially cylindrical, the second portion forms a substantially cylindrical wall around the cavity, and the first partition and the first portion of the second partition respectively form first and second cylinder end walls of the cavity.

8. The lens device of claim 1, wherein a first side of the flexible membrane is adjacent to the first fluidic medium and a second side of the flexible membrane is adjacent to a second fluidic medium.

9. The lens device of claim 8, wherein the second fluidic medium is air from the atmosphere.

10. The lens device of claim 8, further comprising a third partition that is coupled to at least one of the first partition, the second partition, and an intermediate structure that is coupled to at least one of the first partition and the second partition.

11. The lens device of claim 10, wherein a second cavity is formed in between the third partition and the first partition, wherein the first partition extends substantially in between the second and third partitions, and wherein the second fluidic medium is positioned within the second cavity.

12. The lens device of claim 11, further comprising a second component capable of controlling a second parameter of the second fluidic medium, and wherein each of the first and second devices includes at least one actuator selected from the group consisting of a small-mounted pump, a piezoelectric actuator, a microelectromechanical system (MEMS) actuator, and a Teflon-coated screw for controlling and setting fluidic pressure and volume.

13. The lens device of claim 11, wherein the third partition is rigid, and the second and third partitions substantially surround the first partition so that the first partition is shielded from an outside environment.

14. The lens device of claim 10, further comprising a fourth partition that is coupled to the third partition, wherein a third cavity is formed in between the third

partition and the fourth partition, wherein the third partition extends substantially in between the first and fourth partitions, and wherein at least one of the first fluidic medium, the second fluidic medium and a third fluidic medium is positioned within the third cavity.

15. The lens device of claim 14, wherein the third partition is coupled to the first partition by way of the intermediate structure that is an intermediate wall, and wherein the third partition is a flexible membrane.

16. The lens device of claim 15, wherein flexing of the first and third partitions depends upon relative pressures of the fluidic media within the first, second and third cavities.

17. The lens device of claim 15, wherein the lens device is capable of being operated as at least one of a convex lens, a concave lens, a plano-convex lens, a plano-concave lens, a convex-concave lens, a biconvex lens, and a biconcave lens.

18. The lens device of claim 17, wherein the lens device is capable of being operated as at least two of the convex lens, a concave lens, a plano-convex lens, a plano-concave lens, a convex-concave lens, a biconvex lens, and a biconcave lens.

19. The lens device of claim 1, wherein the lens device is capable of being controlled by the component to achieve a range of focal distances.

20. A set of eyeglasses including the lens device of claim 1.

21. A system including the lens device of claim 1, wherein the system is at least one of a camera, a microscope, a video monitor, a video recorder, an optical recording mechanism, a surveillance mechanism, an inspection mechanism, an agile imaging mechanism, a target tracking mechanism, a copy machine, a scanner, a zoom lens system, a cellular phone, a personal digital assistant, a computer, a magnifying glass, and a vision correction device.

22. A multi-lens apparatus comprising:

a first fluidic adaptive lens;

a second fluidic adaptive lens; and

an intermediate structure coupling the first and second fluidic adaptive lenses, wherein the intermediate structure is at least partly optically transparent.

23. The multi-lens apparatus of claim 22, wherein each of the first and second fluidic adaptive lenses includes at least one flexible membrane and at least one rigid surface that together define at least one cavity within which is at least one fluidic medium.

24. The multi-lens apparatus of claim 23, wherein each of the first and second fluidic adaptive lenses includes either one or two flexible membranes.

25. The multi-lens apparatus of claim 22, wherein at least one parameter of each of the at least one fluidic medium is controllable by at least one of means for providing fluid flow and means for varying fluid pressure.

26. The multi-lens apparatus of claim 25, wherein by controlling the at least one parameter, a flexure of the at least one membrane occurs that affects at least one of a lens focal distance and a lens type.

27. A zoom lens system including the multi-lens system of claim 22.

28. A system including the zoom lens system of claim 27, wherein the system is at least one of a camera, a microscope, a video monitor, a video recorder, an optical recording mechanism, a surveillance mechanism, an inspection mechanism, an agile imaging mechanism, a target tracking mechanism, a copy machine, a scanner, a zoom lens system, a cellular phone, a personal digital assistant, a computer, a magnifying glass, and a vision correction device.

29. A method of fabricating a fluidic adaptive lens device, the method comprising:

providing a first structure having a first cavity, wherein the first cavity is only partially enclosed by the first structure;

attaching a first flexible layer and the first structure to one another in a manner that substantially encloses the first cavity;

wherein the first cavity is capable of being filled with a first fluid so that the first structure, first flexible layer, and first fluid interact to form the fluidic adaptive lens device.

30. The method of claim 29, further comprising:

creating at least one channel within at least one of the first structure and the first flexible layer that allows for communication of the first fluid with respect to the cavity.

31. The method of claim 30, further comprising:

coupling at least one fluid reservoir and at least one actuator to the at least one channel to allow for communication of the first fluid with respect to the first cavity; and

communicating the first fluid into the first cavity.

32. The method of claim 29, wherein at least one of the first structure and the first flexible layer includes at least one channel, so that the attaching of the first flexible layer and the first structure to one another encloses the first cavity except for the at least one channel.

33. The method of claim 29, further comprising:

affixing the first structure to a first side of an intermediate substrate; and

affixing a second lens device, to a second side of the intermediate substrate,

wherein the first and second lens devices and the intermediate substrate can be operated together as a zoom lens system.

34. The method of claim 29, further comprising:

providing a second structure having a second cavity, wherein the second cavity is only partially enclosed by the second structure;

attaching the first flexible layer and the second structure to one another in a manner that substantially encloses the second cavity.

35. The method of claim 34, wherein the additional structure includes the second cavity and a third cavity.

36. A method of operating a lens device, the method comprising:

providing a lens structure including a flexible layer and a rigid structure coupled to one another and forming a cavity; and

adjusting a fluid pressure of fluid within the cavity so as to adjust a flexure of the flexible layer.

37. The method of claim 36, wherein the adjusting of the fluid pressure causes at least one of a change in a focal distance and a change in lens type.